



EEG

**ELECTRO
ENCEPHAL
OGRAPHY**

**RESEARCH
METHODS**

THE PLAN

Questions

The right questions.

Basics

EEG overview.

Components

Recognizing ERP components.

Paradigms

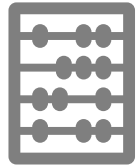
Eliciting ERP responses.

Data

Let's look at data.

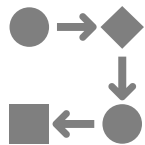
QUESTIONS

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OGRAPHY



COMPUTATIONAL LEVEL

Goal of computation
Output of computation



ALGORITHMIC LEVEL

How to achieve the goal
Process or algorithm

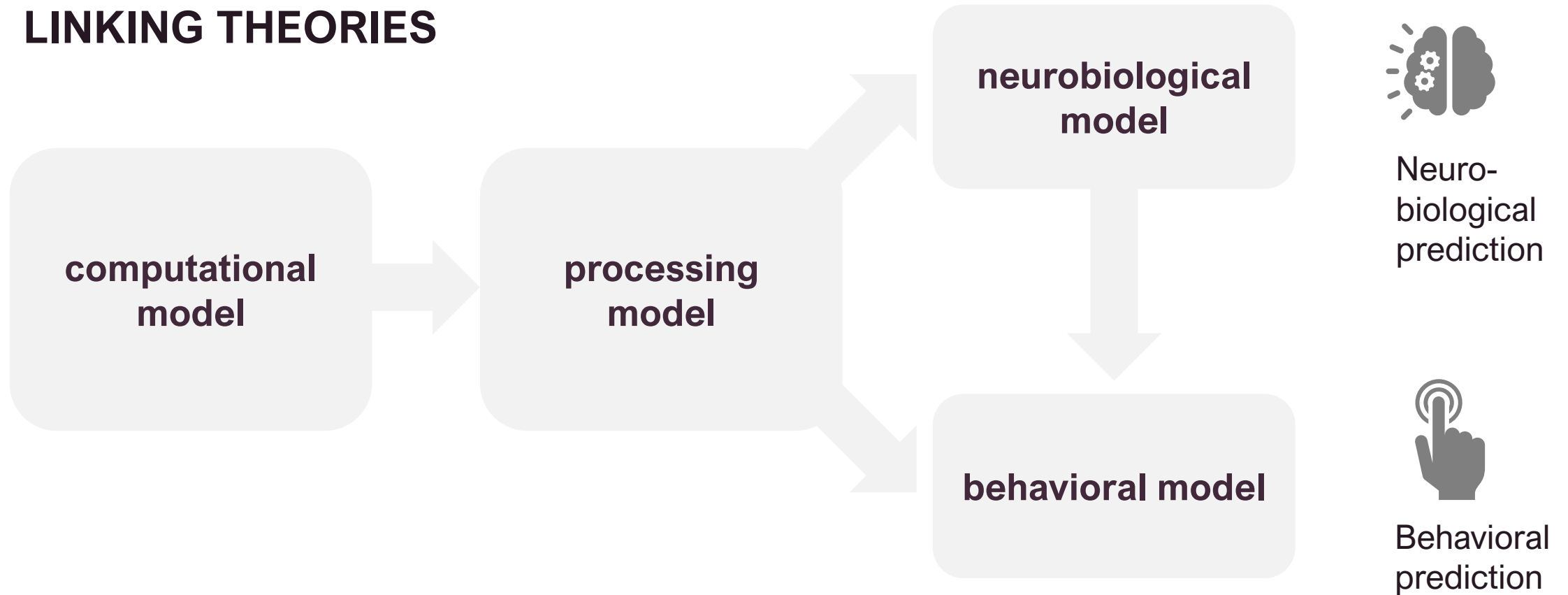


IMPLEMENTATIONAL LEVEL

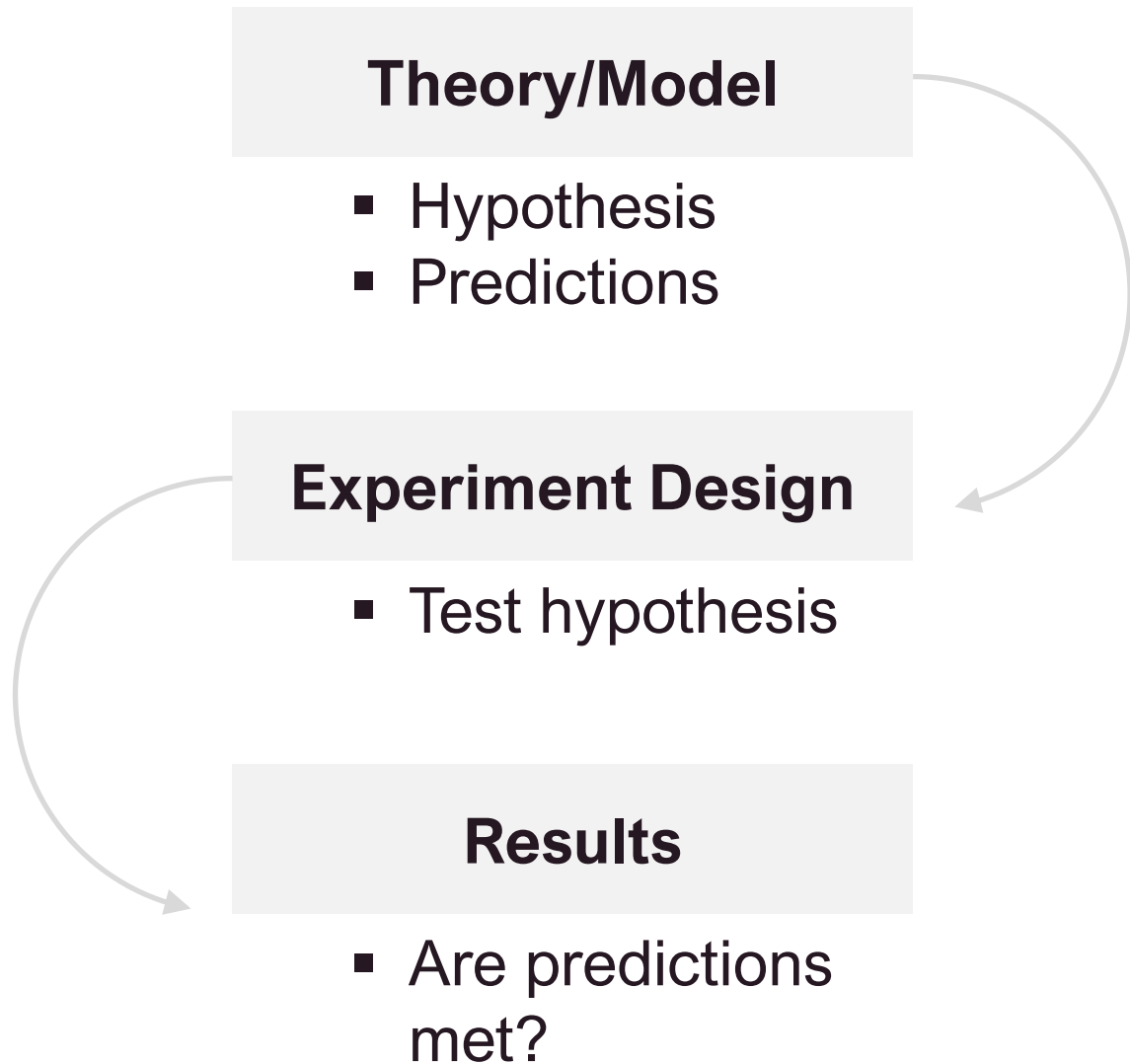
How to execute the algorithm
Physical process



LINKING THEORIES



QUESTIONS



THE FLOW

1. Question
2. Research
3. Hypothesis
4. Experiment
5. Analysis
6. Interpretation
7. Dissemination



BASICS

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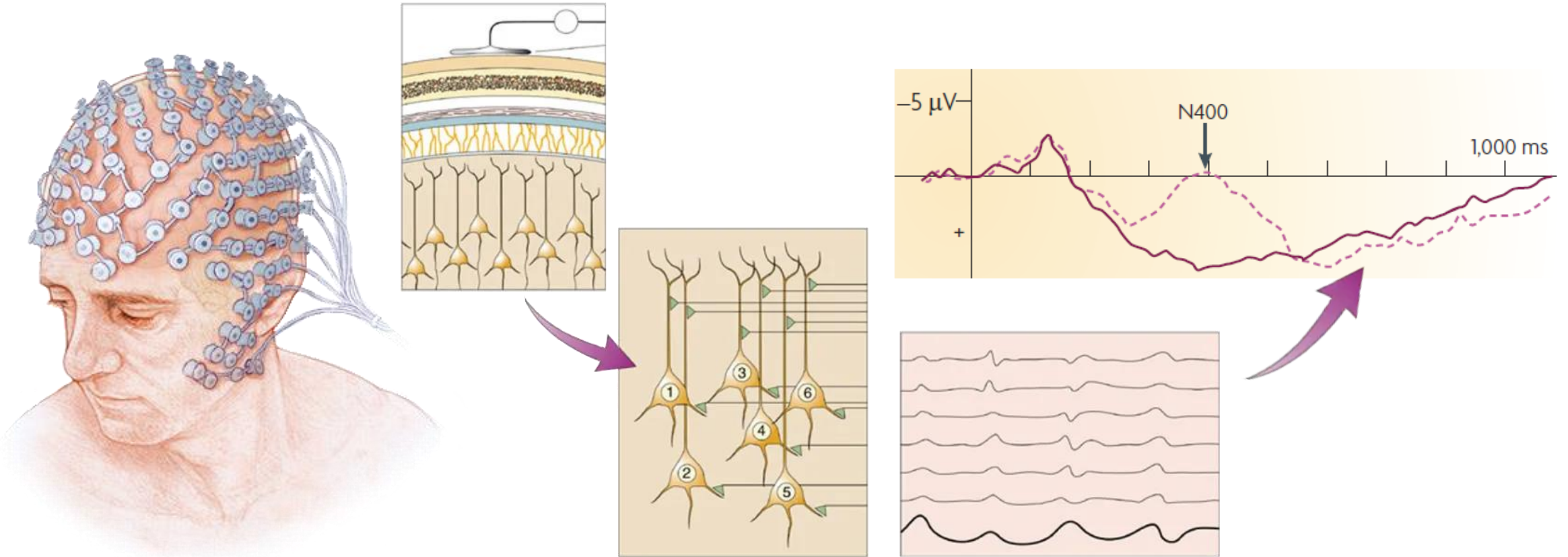
EEG MEASURES ELECTRICAL ACTIVITY IN THE BRAIN.

Electrophysiology measures the work as it is being done.

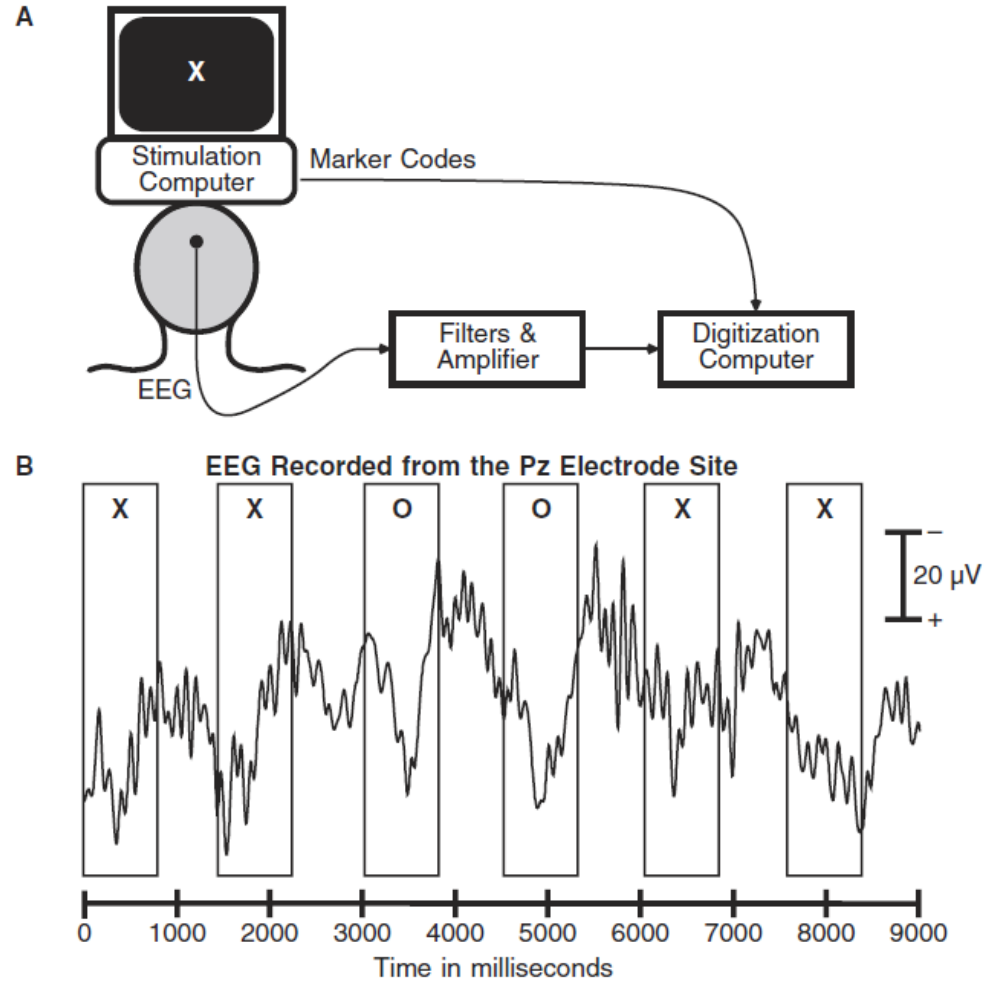
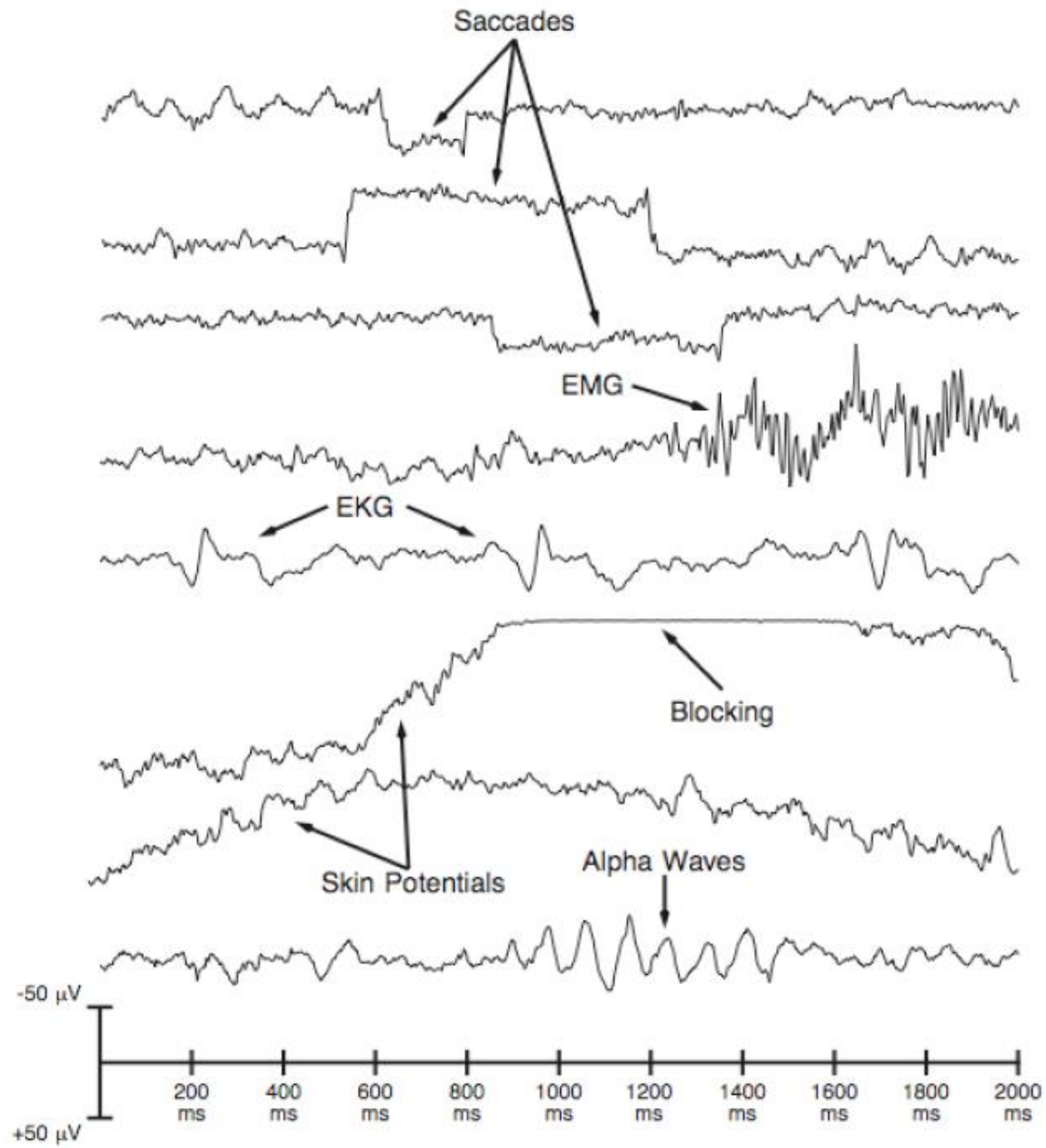
- Stages of processing
- *Covert* processes
- Mental representations
- Algorithmic level

BASICS

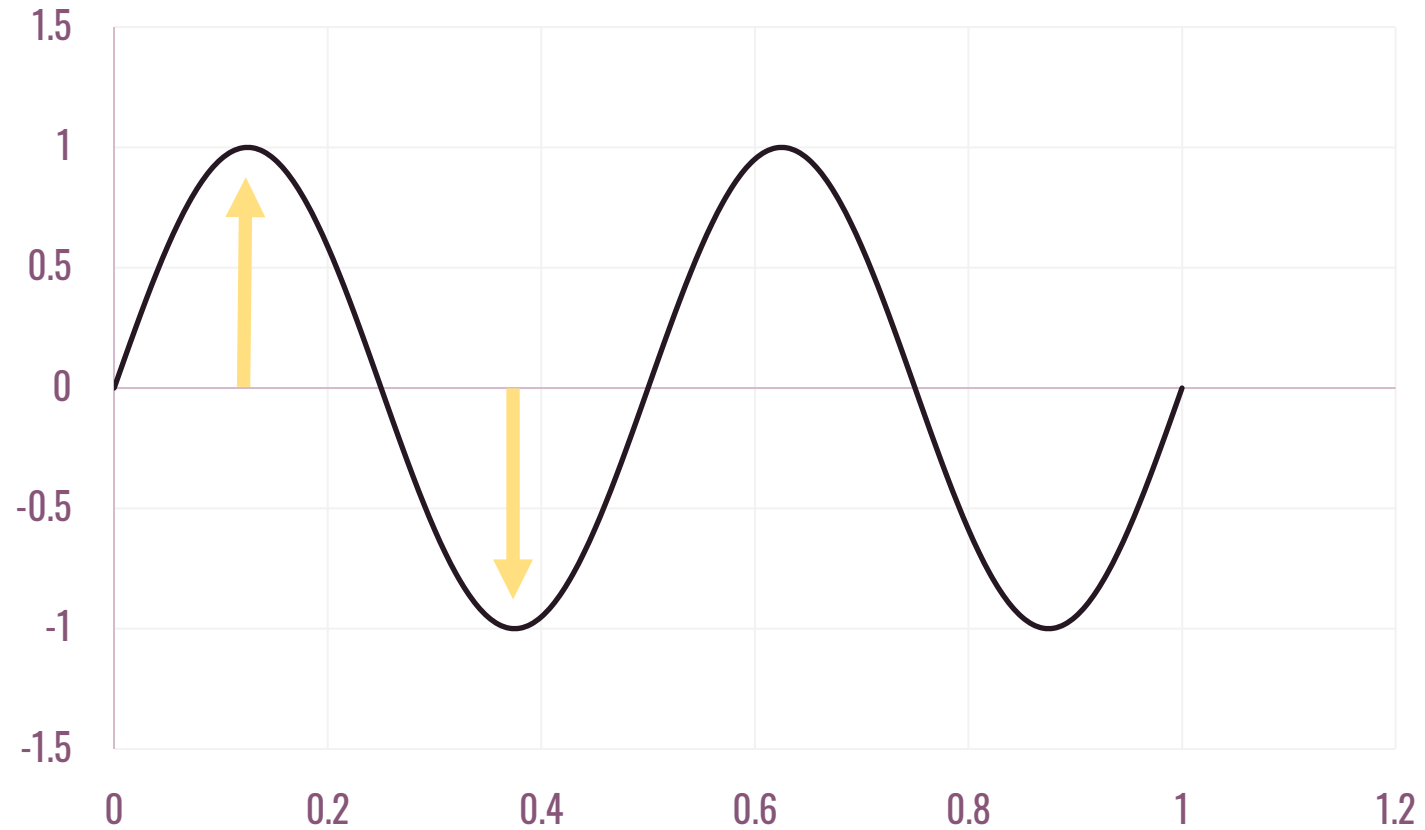
EVENT-RELATED POTENTIALS



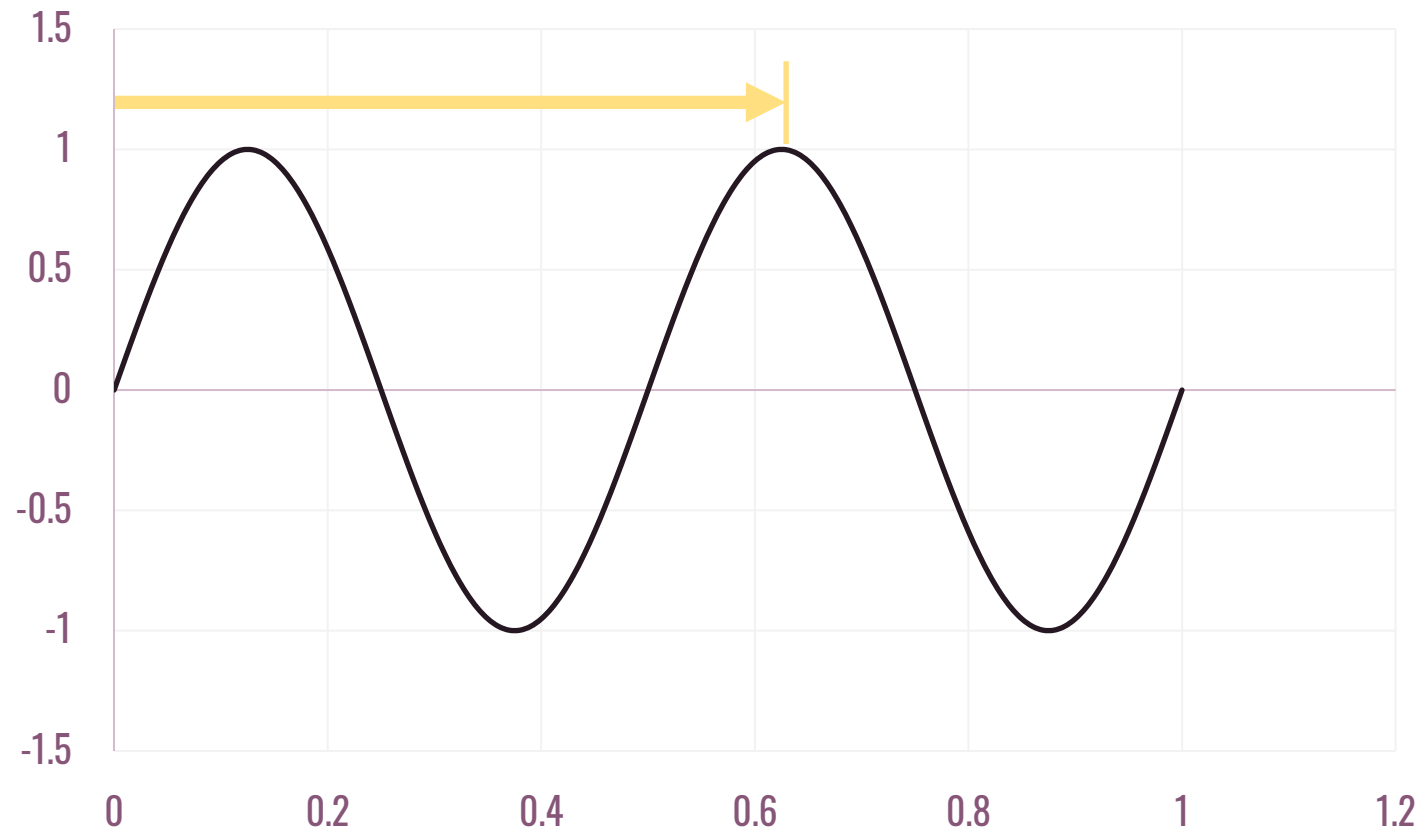
BASICS



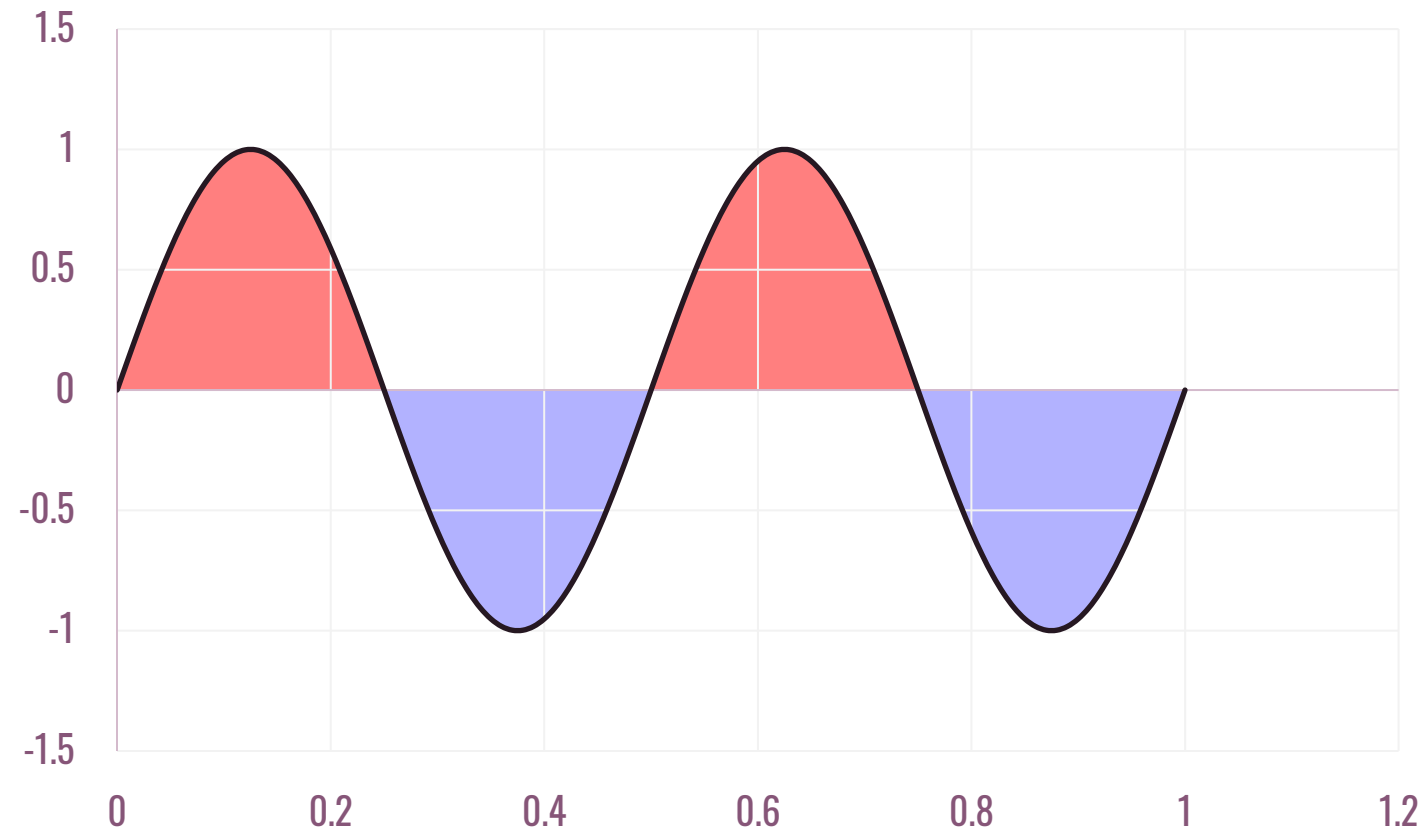
AMPLITUDE



LATENCY

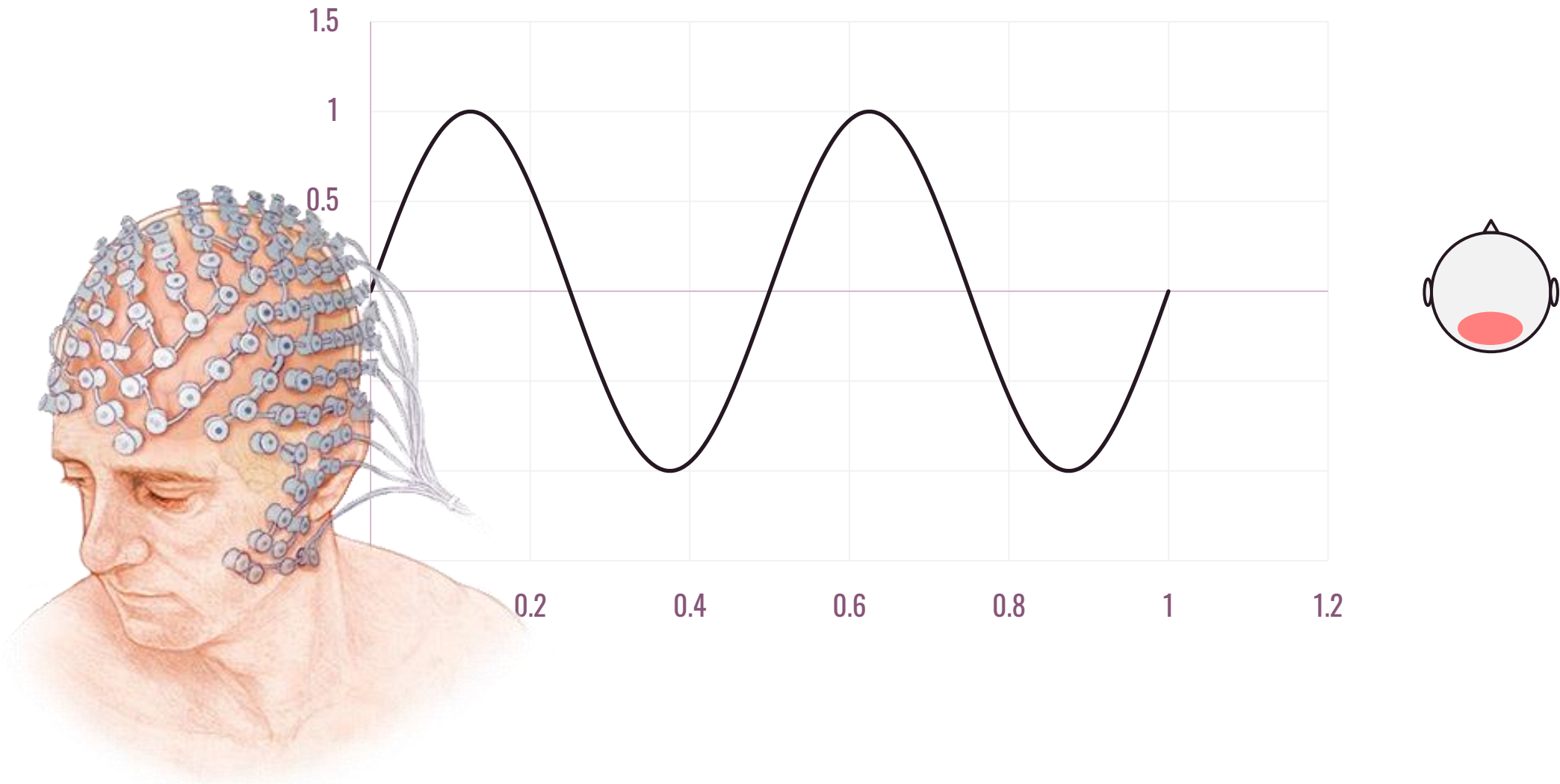


POLARITY

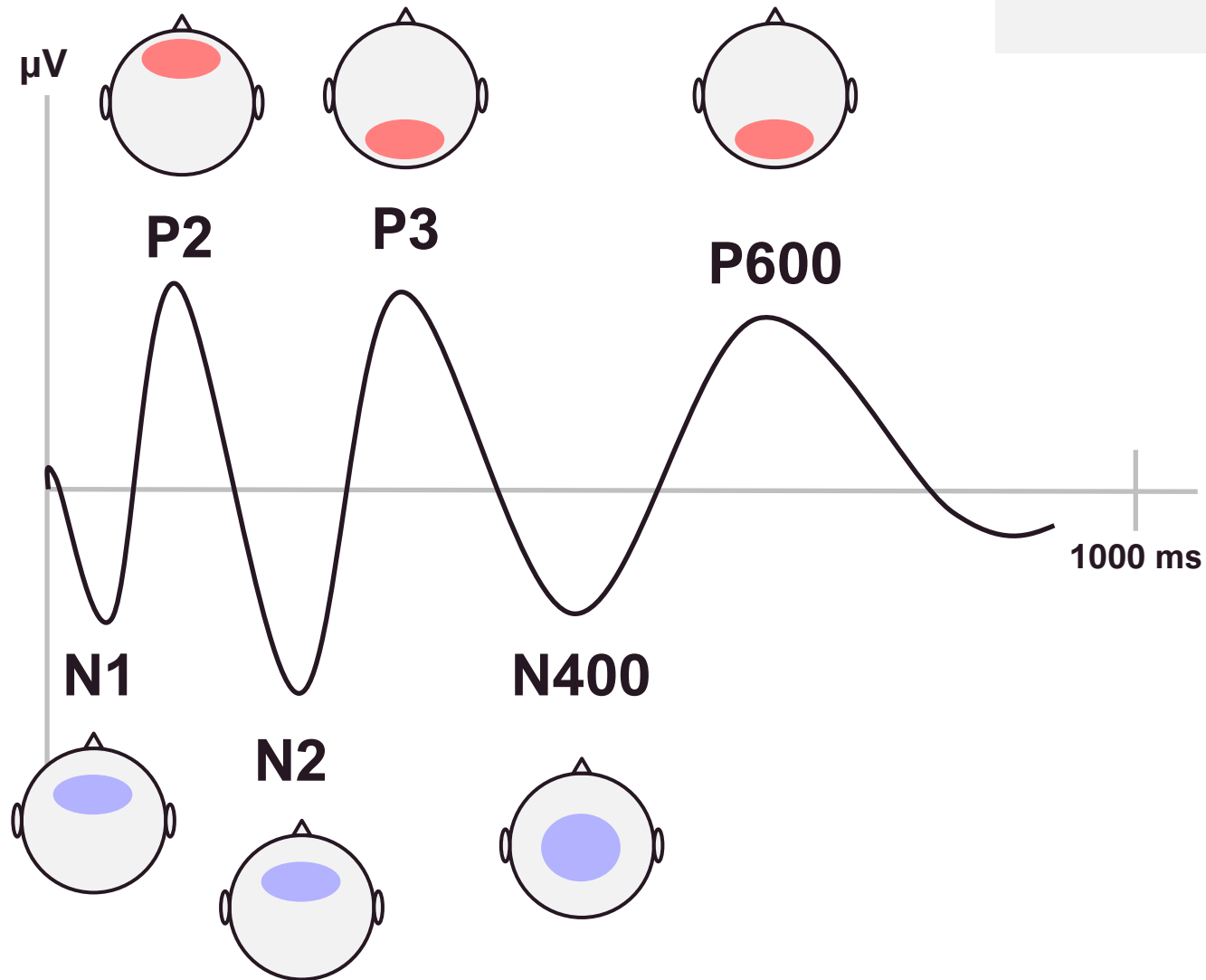


COMPONENTS

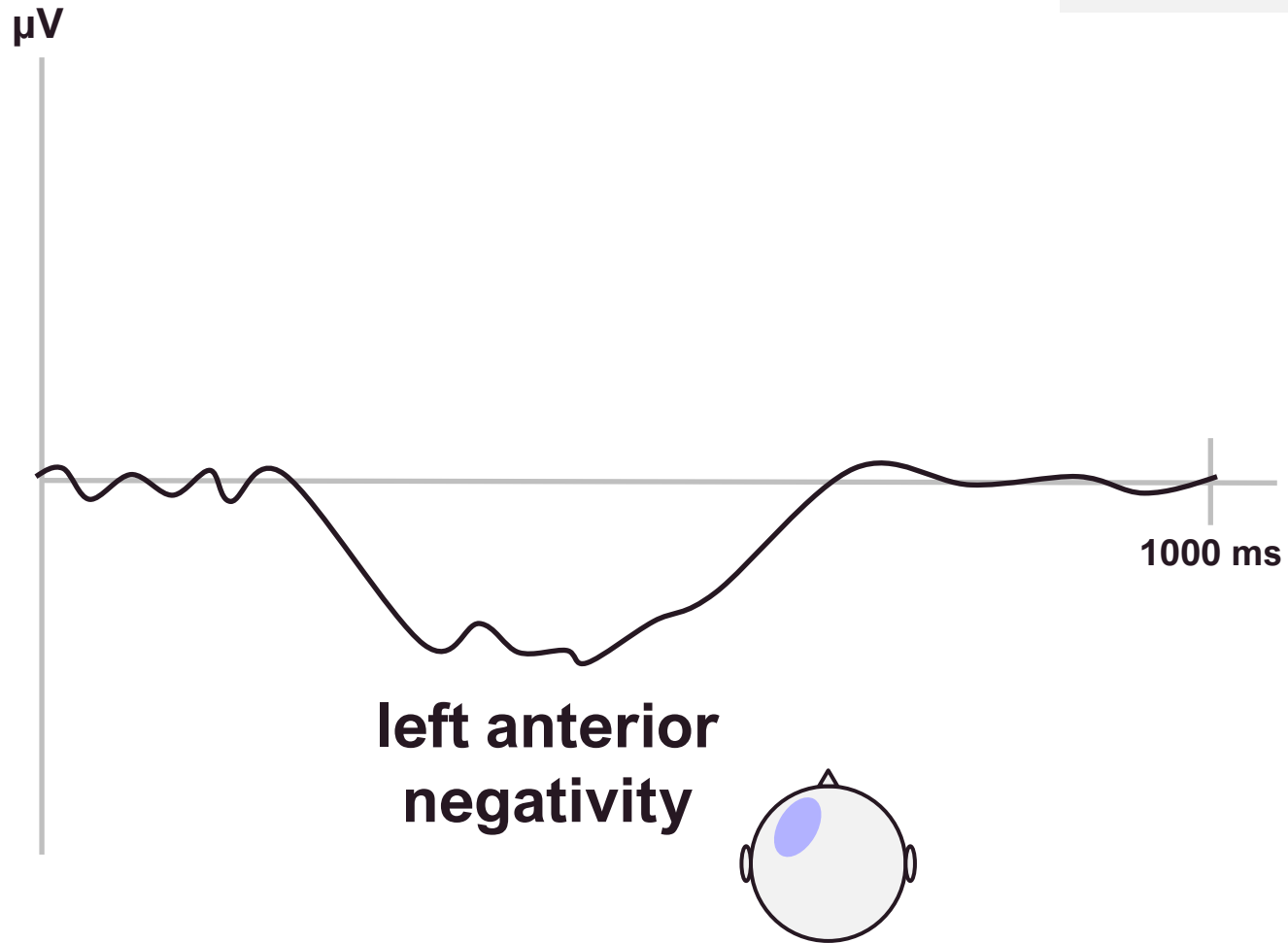
TOPOGRAPHY



COMPONENTS



COMPONENTS



PARADIGMS

Paradigms

Oddball

Go/No-Go

Decision Tasks

Crossmodal Priming

Self-Paced Reading

Rapid Serial Visual

Presentation

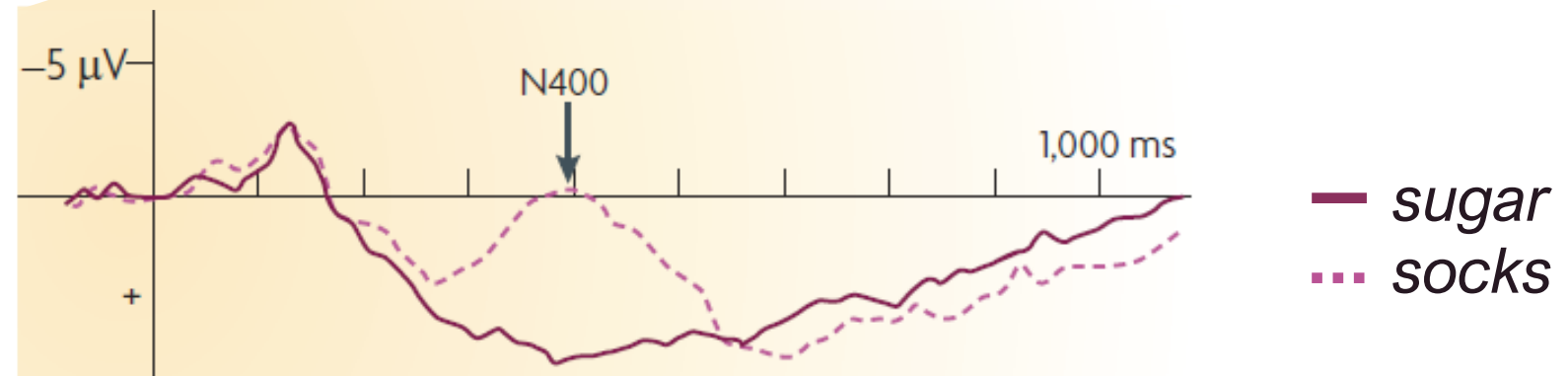
Oddball Paradigm

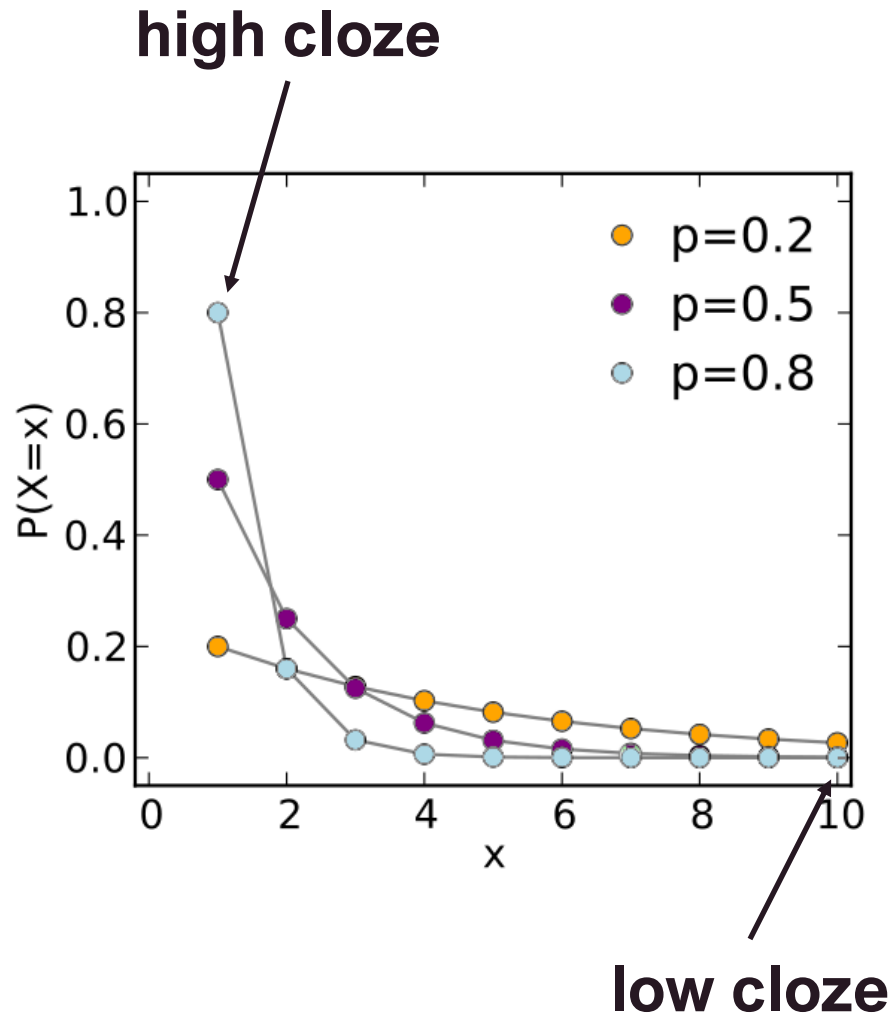


RSVP Paradigm



I take my coffee with cream and **socks**





high cloze

*I take my coffee with cream and **sugar** .*

low cloze

*I take my coffee with cream and **socks** .*

DATA

Raw recording

High-pass filter

Segmentation

Baseline correction

Preprocessing

Eyeblink subtraction

Movement correction

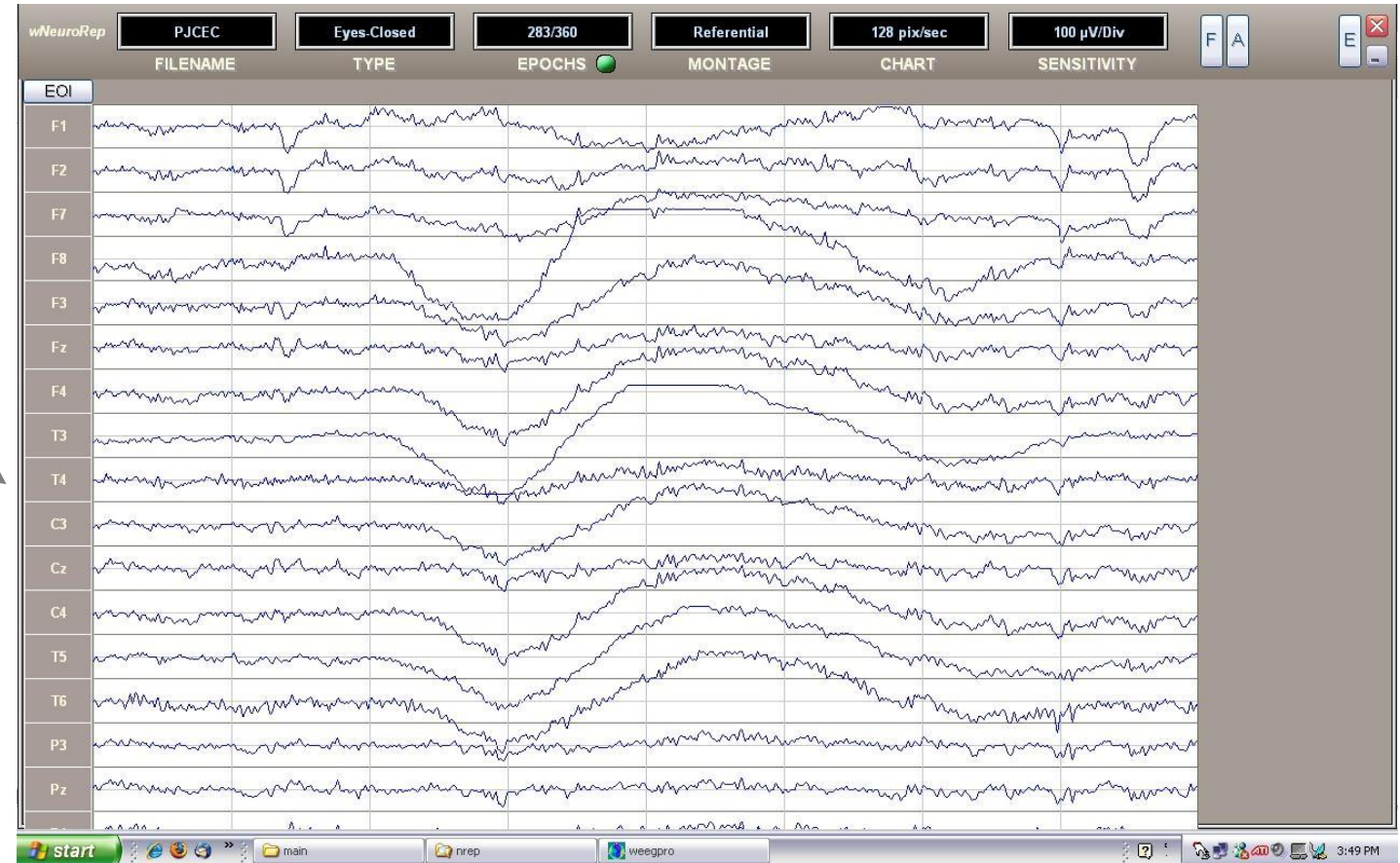
Bad channel

interpolation

Averaging

Re-referencing

Data extraction

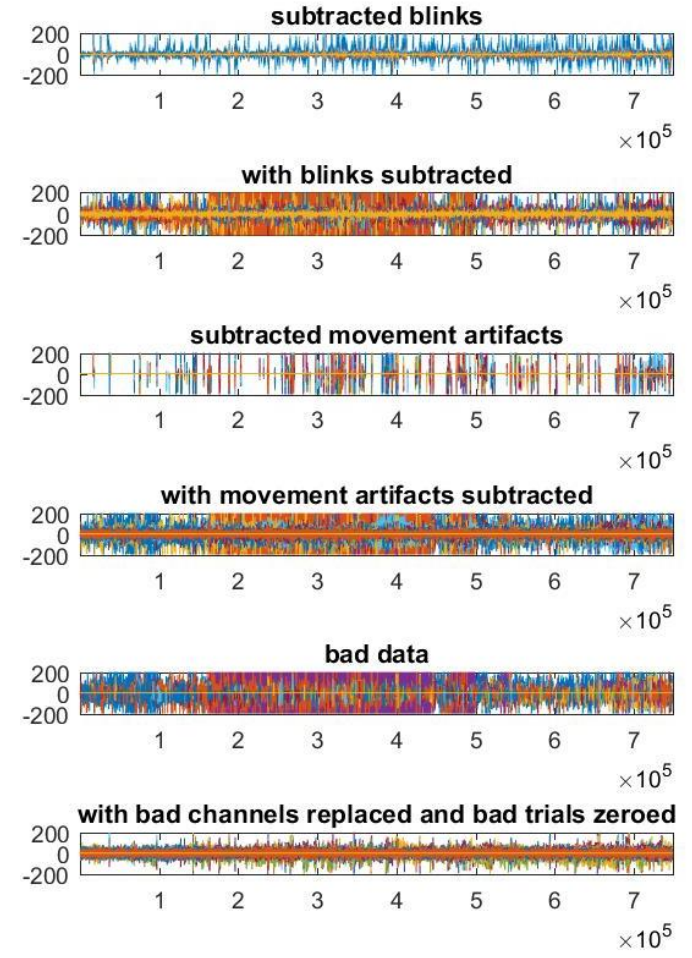


DATA

Raw recording
High-pass filter
Segmentation
Baseline correction

Preprocessing
Eyeblink subtraction
Movement correction
Bad channel interpolation

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Re-referencing
Data extraction



DATA

Raw recording

High-pass filter

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Baseline correction

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Eyeblink subtraction

Movement correction

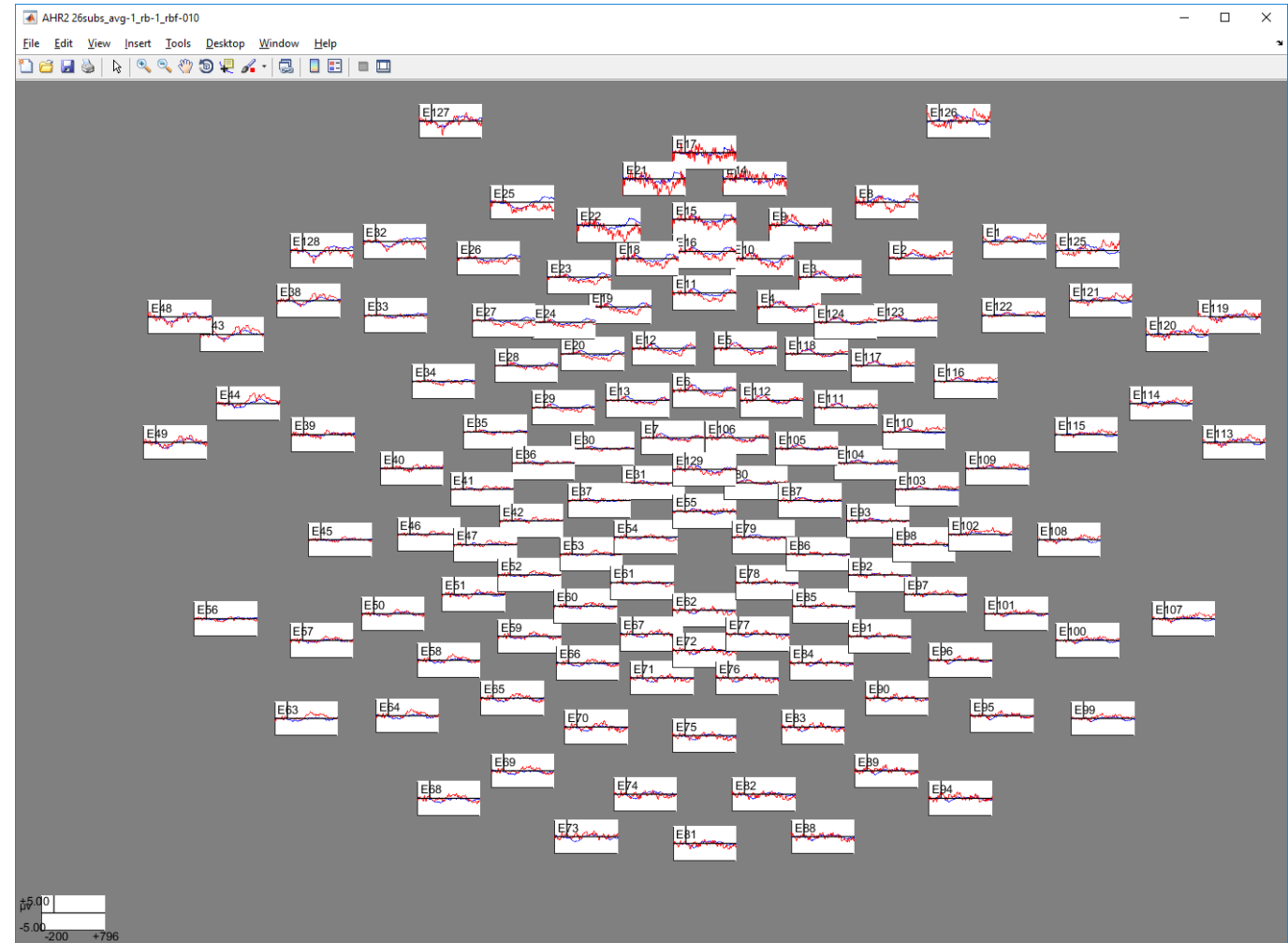
Bad channel

interpolation

Averaging

Re-referencing

Data extraction



DATA

Extraction methods

Peak picking
Previous literature
PCA
Cluster analysis
Mass univariate analysis

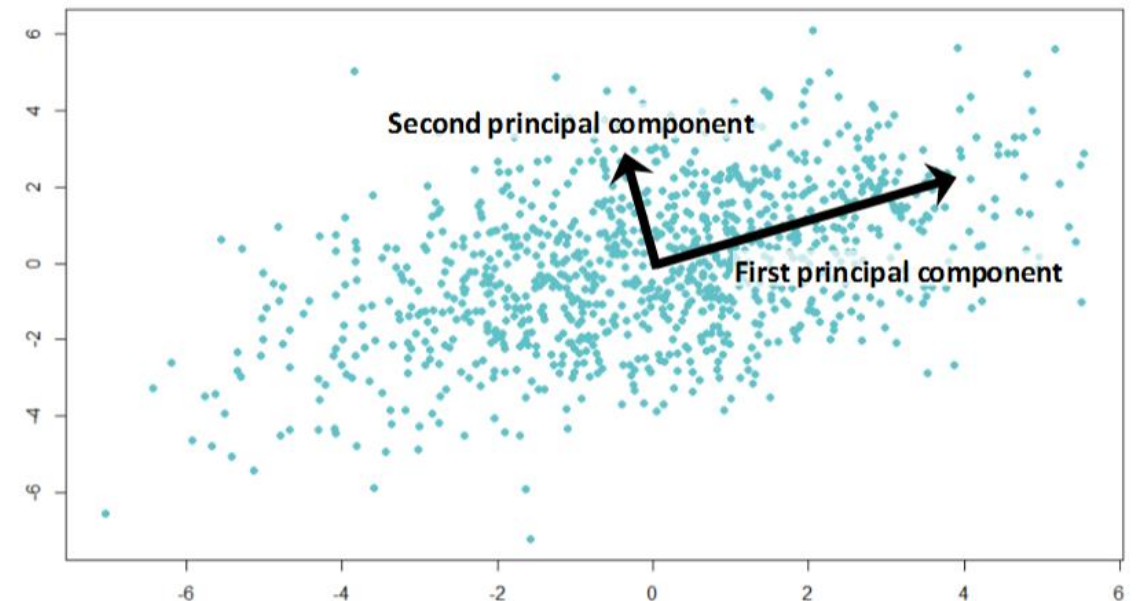


Analysis tools

Recorder software
EEGlab
Fieldtrip
EP toolkit
Rstats

Data Extraction

How do we choose what data to extract / analyze?



PIPELINE

Temporal PCA

Scree.

View topoplots.

Select temporal factor.

Export variance scores.

Export factor loadings.

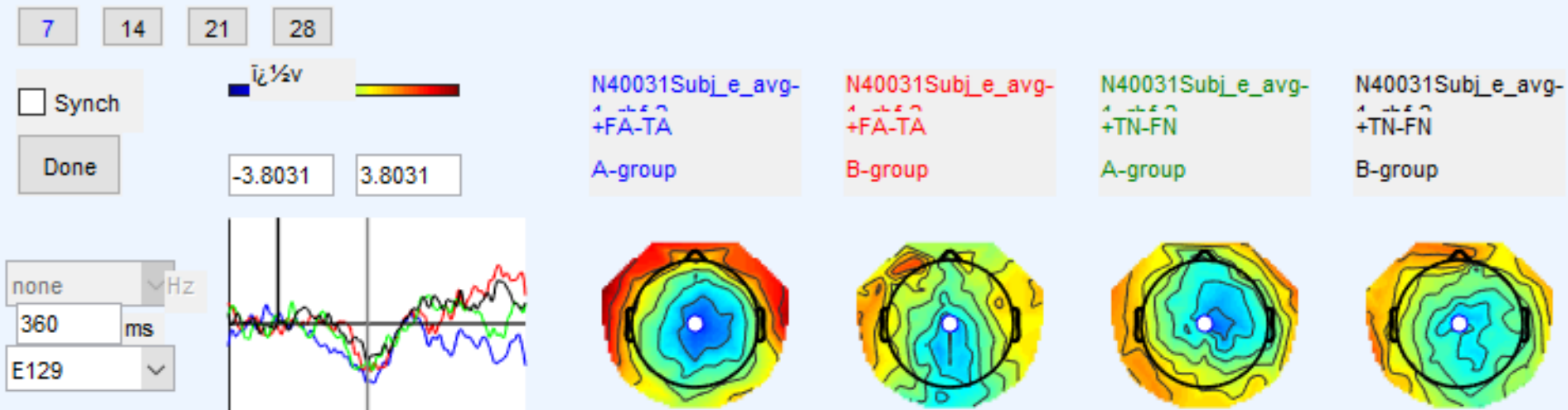
DATA

PCA

EP toolkit.

PCA finds underlying components in the data.

Specify time window and spatial region.



DATA

PIPELINE

Temporal PCA

Scree.

View topoplots.

Select temporal factor.

Export variance scores.

Export factor loadings.

Spatial PCA

Scree

View topoplots.

Select temporospatial
factor.

Window: define ROI.

PCA

EP toolkit.

PCA finds underlying
components in the data.

Specify time window
and spatial region.

Output

Time window

Spatial ROI